

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-325526

(43)Date of publication of application : 10.12.1996

(51)Int.Cl.

C09J 4/02

C09J 4/02

C09J 4/06

G11B 23/00

(21)Application number : 07-136978

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(22)Date of filing : 02.06.1995

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### (54) ADHESIVE FOR METAL HUB

#### (57)Abstract:

**PURPOSE:** To obtain an adhesive for a metal hub containing a (meth)acrylate having carboxylic acid group and a photoinitiator, excellent in adhesive strength of the metal hub to a resin substrate and useful for optical information disks.

**CONSTITUTION:** The adhesive for bonding an optical information disk to a metal hub contains (A) a (meth)acrylate having carboxylic acid group (e.g. 2-acryloyloxyethylmalonic acid or 2-acryloyloxyethylphthalic acid) and (B) a photoinitiator (e.g. 4-dimethylaminoacetophenone or benzophenone). Furthermore, the adhesive contains preferably a cross-linkable (meth)acrylic oligomer (e.g. spiroglycolurethane diacrylate or bisphenol A type epoxy acrylate).

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CLAIMS

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[Claim(s)]

[Claim 1]Adhesives for metal hubs containing acrylate which has a resin substrate and in which these adhesives have a carboxylic acid group in adhesives on which a light information disk with which it comes to record information, and a metal hub are pasted up (meta), and a photoinitiator.

[Claim 2]The adhesives for metal hubs according to claim 1 which contain monofunctional and/or polyfunctional (meta) acrylate further.

[Claim 3]The adhesives for metal hubs according to claim 1 or 2 which contain cross-linking (meta) acrylic oligomer further.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to improvement of the UV cure adhesive on which the metal hub used especially for a light information disk is pasted up about the light information disk which performs record of information, playback, or elimination using lights, such as a magneto-optical disc and an optical disc.

[0002]

[Description of the Prior Art]As a method which loads a drive with the light information disk which performs record of information, playback, or elimination using lights, such as a magneto-optical disc and an optical disc, the magnet clamp method is used widely.

[0003]With the permanent magnet which established the center hub in the central part of the light information disk and in which this center hub was established at the drive side, this method draws in and is held.

Generally the metal insertion hub which embedded some metal plates to resin and carried out integral moulding as a center hub is used.

[0004]However, since the metal insertion hub needs to process a metal plate into the shape of having been suitable for embedding, beforehand and needs to carry out integral moulding of this with resin, it has the problem that a process is complicated and a manufacturing cost becomes high.

[0005]In order to examine the trial which uses the metal hub created only with metal in order to solve this problem and to paste up a metal hub and a resin substrate, the UV cure adhesive which uses a urethane acrylate system as the main ingredients is proposed, but. The adhesion of substrate material resin, such as polycarbonate, and metal was not enough, and it had a fault from which the fall of the adhesive strength after prolonged use takes place.

[0006] In order to solve the above-mentioned problem, form a through hole in a metal hub, process the shape of a metal hub, such as pasting up with ultraviolet curing nature adhesives, and the trial holding adhesive strength is proposed, but. In the described method, it has the problem that forming cost is high too, from it being necessary to process a metal hub further.

[0007]

[Problem(s) to be Solved by the Invention] This invention makes the technical problem development of UV cure adhesive which pastes up a metal hub on a resin substrate firmly directly paying attention to such a problem.

[0008]

[Means for Solving the Problem] By considering it as UV cure adhesive which contains acrylate which has a carboxylic acid group for adhesives for metal hubs (meta), and a photoinitiator as a result of this invention person's inquiring wholeheartedly, in order to solve the above-mentioned technical problem, It finds out that a resin substrate and a metal hub can be pasted up firmly, and came to complete this invention.

[0009] That is, adhesives for metal hubs of this invention are characterized by being ultraviolet curing type acrylic adhesives containing acrylate which has a carboxylic acid group (meta), and a photoinitiator.

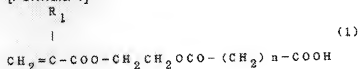
[0010] Polycarbonate, polymethylmethacrylate, amorphous polyolefine, etc. can be illustrated as construction material of a resin substrate in this invention.

[0011] If it has magnetic properties equivalent to stainless steel SUS430 or this which is specified to JIS G4303 as a metal hub in this invention, it can be used satisfactorily.

[0012] Acrylate which has a carboxylic acid group used for this invention (meta) has the structure shown by the general formula (1) and (2).

[0013]

[Formula 1]



(但し、 $\text{R}_1$  は水素原子またはメチル基、 $n$  は1～4の整数を示す。)

[0014]

[Formula 2]



(但し、 $\text{R}_2$  および  $\text{R}_3$  は、それぞれ水素原子またはメチル基、 $\text{R}_4$  は、 $-\text{C}_6\text{H}_4\text{COOH}$ 、 $-\text{C}_6\text{H}_8\text{COOH}$  または  $-\text{C}_6\text{H}_{10}\text{COOH}$  を示す。)

[0015]As acrylate expressed with the general formula (1) in this invention (meta), 2-acryloyloxyethyl malonic acid, 2-methacryloiloxy-ethyl malonic acid, 2-acryloyloxyethyl succinic acid, 2-methacryloiloxy-ethyl succinic acid, 2-acryloyloxyethyl glutaric acid, 2-methacryloiloxy-ethyl glutaric acid, etc. are illustrated.

[0016]As acrylate expressed with a general formula (2) (meta), 2-acryloyloxyethyl phthalic acid, 2-methacryloiloxy-ethyl phthalic acid, 2-acryloyloxypropyl phthalic acid, 2-methacryloyl oxypropyl phthalic acid, 2-acryloyloxyethyl tetrahydrophthalic acid, 2-methacryloiloxy-ethyl tetrahydrophthalic acid, 2-acryloyloxyethylhexahydrophthalic acid, 2-methacryloyloxy ethylhexahydrophthalic acid, 2-acryloyloxypropyl hexahydrophthalic acid, 2-AKUROYLOXY propyl tetrahydrophthalic acid, etc. and these position isomers (o-, m-, p-object) are illustrated.

[0017]The number of acrylate which has this carboxylic acid group (meta) may be one, and it may use two or more kinds together.

[0018]In order to acquire sufficient toughness of sufficient adhesive strength with metal, and/or resin after hardening, 10 % of the weight - 80 % of the weight of the whole ingredient of an addition of acrylate which has a carboxylic acid group in this invention (meta) hardened by ultraviolet rays is preferred.

[0019]Besides acrylate which has the above-mentioned carboxylic acid group which improves an adhesive property with metal in adhesives for metal hubs in this invention (meta), Cross-linking (meta) acrylate oligomer may be mixed as a purpose of improving monofunctional or polyfunctional (meta) acrylate, and toughness for the purpose of improving an adhesive property with a resin substrate.

[0020]As monofunctional or polyfunctional (meta) acrylate added in order to improve, an adhesive property with a resin substrate by this invention, Isoamyl acrylate, isoamyl methacrylate, laurylacrylate, Lauryl methacrylate, stearylacrylate, stearyl methacrylate, Isooctyl acrylate, isooctyl methacrylate, benzyl acrylate, Benzyl methacrylate, butoxy ethyl acrylate, butoxyethylmethacrylate, Phenoxy ethyl acrylate, phenoxy ethyl methacrylate, Tetrahydrofurfuryl acrylate, tetrahydrofurfuryl methacrylate, Ethoxydiethylene-glycol acrylate, methoxy triethylene glycol acrylate, Triethylene glycol diacrylate, neopentyl glycol diacrylate, Neopentyl glycol dimethacrylate, 1, 6-hexanediol diacrylate, 1, 6-hexanedioldimethacrylate, trimethylolpropane triacrylate, trimethylolpropanetrimethacrylate, ethyleneoxide denaturation

trimethylolpropane triacrylate, pentaerythritol -- doria -- KURIRETO and pentaerythritol trimethacrylate. Dipentaerythritol hexaacrylate, pentaerythritol tetraacrylate, neopentyl glycol acrylic acid benzoic ester, trimethylolpropanacrylic acid benzoic ester, etc. are illustrated.

[0021]The number of monofunctional [ this ] or polyfunctional (meta) acrylate may be one, and it may use two or more kinds together.

[0022]90 or less % of the weight of the whole ingredient of an addition of monofunctional [ in this invention ] or polyfunctional (meta) acrylate hardened by ultraviolet rays is preferred.

[0023]If an addition exceeds 90 % of the weight, an addition of acrylate which has a carboxylic acid group (meta) will be less than 10 % of the weight inevitably, and adhesive strength with metal to need is not obtained.

[0024]As a typical thing of cross-linking (meta) acrylic oligomer added in order to improve toughness in this invention, Polyester (meta) acrylate, polyether (meta) acrylate, Polyurethane (meta) acrylate, epoxy (meta) acrylate, etc. can be illustrated, Specifically Polyurethane diacrylate, polyurethane dimethacrylate, Spiroglycol urethane diacrylate, spiroglycol urethane dimethacrylate, Bisphenol A type epoxy acrylate, bisphenol A type epoxy methacrylate, Bisphenol female mold epoxy acrylate, bisphenol female mold epoxy methacrylate, Phenol novolac type epoxy acrylate, phenol novolac type epoxy methacrylate, cresolnovolac type epoxy acrylate, cresolnovolac type epoxy methacrylate, etc. can be illustrated.

[0025]Although these (meta) acrylate is useful as cross-linking oligomer which is rich in practicality, what carried out acrylic ester (meta) denaturation of the resin, such as unsaturated polyester, polysulfone, polyether sulphone, and polyphenylene oxide, in addition to these can fully be used.

[0026]Although a molecular weight of cross-linking oligomer used by this invention can be used [ a quite wide range ], the molecular weights 200-50000 are preferred.

[0027]The number of these cross-linking oligomer may be one, and it may use two or more kinds together.

[0028]50 or less % of the weight of the whole ingredient of a cross-linking oligomer addition in this invention hardened by ultraviolet rays in that quantitative dispensing of resin at the time of mixed resin not becoming hyperviscosity too much and attaching a hub is possible is preferred.

[0029]A monomer and oligomer which are hardened with light in this invention, Although it is satisfactory in constituting adhesives for metal hubs from both acrylate and methacrylate in any way, it is more practical for an acrylate monomer and oligomer to constitute from a difference in a cure rate by ultraviolet rays.

[0030]It is required for adhesives for metal hubs of this invention to aim at an ultraviolet curing type, therefore to add at least one or more kinds of photoinitiators.

[0031]As a photoinitiator in this invention, 1-hydroxycyclohexylphenyl ketone, Benzophenone,

a thioxan ton, alkylthio xanthone, a 2,2-dimethoxy- 2-phenylacetophenone, 2-benzyl-2-dimethylamino 1 -(4-morpholinophenyl)- Butan-1-one, 2,2-dimethoxy- 1,2-diphenylethan 1-one, a diethoxyacetophenone, 4-dimethylamino acetophenone, 4-diethylamino benzophenone, 4,4'-tetramethyl aminobenzophenone, 4,4'-tetraethyl aminobenzophenone, 4-dimethylamino ethyl benzoate, 4-dimethylaminobenzoic acid propyl, 4-dimethylamino isoamyl benzoate, 4-diethylamino ethyl benzoate, 4-diethylamino benzoic acid propyl, 4-diethylamino isoamyl benzoate, etc. can be illustrated, and they can be used, these photoinitiators being able to be independent or combining them.

[0032]As for an addition of a photoinitiator in this invention, 0.1 to 10 % of the weight is preferred to the whole ingredient hardened by ultraviolet rays in order not to cause a shortage of adhesive strength due to a fall of three-dimensional crosslinking density of adhesives after hardening.

[0033]Although UV cure adhesive for metal hubs in this invention comprises monofunctional or polyfunctional (meta) acrylate, and cross-linking (meta) acrylic oligomer which are added acrylate which has the above-mentioned carvone group (meta), a photoinitiator, and if needed, In order to prevent a dark reaction under thermal polymerization and storage at the time of manufacture, it is preferred to add publicly known thermal polymerization inhibitors, such as hydroquinone monomethyl ether, t-butylcatechol, p-benzoquinone, 2,5-t-butylhydroquinone, and Feni thiazine.

[0034]Uniform spreading nature can be given and at least one or more kinds of leveling agents can also be added from the purpose of controlling generating of an application defect, to adhesives.

[0035]As this leveling agent, generally a silicone series surface-active agent and a fluorochemical surfactant are known, and these can be especially used without restriction.

[0036]These additions are usually 0.01 to 3 % of the weight to adhesives.

[0037]

[Example]Hereafter, although an example explains this invention still in detail, this invention is not limited only to these examples.

[0038]The example 12-acryloyloxyethyl malonic acid 50g, 20 g of tetrahydrofurfuryl acrylate, 20 g of trimethylolpropane triacrylate, and 10 g of spiroglycol urethane diacrylate were mixed, and adhesive base resin was prepared.

[0039]Addition candle power mixing of 5g of 4-dimethylamino acetophenones and 5 g of the benzophenone was carried out to this base resin whole quantity, and the adhesives for metal hubs were prepared.

[0040]These adhesives 0.5g were applied to the magneto-optical disc made from polycarbonate 86 mm in diameter, and the metal hub for the product magneto-optical discs made from the Kato spring (SUS430) was pasted up by ultraviolet rays exposure. The addition

exposure dose of the ultraviolet rays at the time of this exposure was  $7000 \text{ mJ/cm}^2$  ( $\lambda = 365 \text{ nm}$ ).

[0041] Thus, after saving the created metal hub adhesion disk under the environment of 80 % and 85% humidity for 2000 hours, the product made from the Abe trading company and the adhesive strength measuring instrument (trade name "Sebastian V") were used, and the adhesive strength environmental retention test before and after an examination was measured. A measurement result is shown in Table 1.

[0042] The example 22-acryloyloxyethyl phthalic acid 50g, 20 g of tetrahydrofurfuryl acrylate, 20 g of trimethylolpropane triacrylate, and 10 g of spiroglycol urethane diacrylate were mixed, and adhesive base resin was prepared.

[0043] Addition candle power mixing of 5g of 4-dimethylamino acetophenones and 5 g of the benzophenone was carried out to this base resin whole quantity, and the adhesives for metal hubs were prepared.

[0044] These adhesives 0.5g were applied to the magneto-optical disc made from polycarbonate 86 mm in diameter, and the metal hub for the product magneto-optical discs made from the Kato spring (SUS430) was pasted up by ultraviolet rays exposure. The addition exposure dose of the ultraviolet rays at the time of this exposure was  $7000 \text{ mJ/cm}^2$  ( $\lambda = 365 \text{ nm}$ ).

[0045] Thus, after saving the created metal hub adhesion disk under the environment of 80 % and 85% humidity for 2000 hours, the product made from the Abe trading company and the adhesive strength measuring instrument (trade name "Sebastian V") were used, and the adhesive strength environmental retention test before and after an examination was measured. A measurement result is shown in Table 1.

[0046] The example 32-acryloyloxypropyl phthalic acid 50g, 20 g of tetrahydrofurfuryl acrylate, 20 g of trimethylolpropane triacrylate, and 10 g of spiroglycol urethane diacrylate were mixed, and adhesive base resin was prepared.

[0047] Addition candle power mixing of 5g of 4-dimethylamino acetophenones and 5 g of the benzophenone was carried out to this base resin whole quantity, and the adhesives for metal hubs were prepared.

[0048] These adhesives were used, the metal hub was pasted up on the magneto-optical disc made from polycarbonate like Example 1, the same environmental retention test was carried out, and the adhesive strength before and behind an examination was measured. A measurement result is shown in Table 1.

[0049] 50 g of example 42-acryloyloxyethylhexahydrophthalic acid, 20 g of 1,6-hexanediol diacrylate, and pentaerythritol -- doria -- 20 g of KURIRETO and 10 g of bisphenol A type epoxy acrylate were mixed, and adhesive base resin was prepared.

[0050] Addition candle power mixing of 2g of 1-hydroxycyclohexylphenyl ketone and 3 g of the



benzophenone was carried out to this base resin whole quantity, and the adhesives for metal hubs were prepared.

[0051] These adhesives were used, the metal hub was pasted up on the magneto-optical disc made from polycarbonate like Example 1, the same environmental retention test was carried out, and the adhesive strength before and behind an examination was measured. A measurement result is shown in Table 1.

[0052] the example 52-acryloyloxyethyl tetrahydrophthalic acid 50g, 20 g of neopentyl glycol diacrylate, and pentaerythritol -- doria -- 20 g of KURIRETO and 10 g of bisphenol A type epoxy acrylate were mixed, and adhesive base resin was prepared.

[0053] Addition candle power mixing of 2g of 1-hydroxycyclohexylphenyl ketone and 3 g of the benzophenone was carried out to this base resin whole quantity, and the adhesives for metal hubs were prepared.

[0054] These adhesives were used, the metal hub was pasted up on the magneto-optical disc made from polycarbonate like Example 1, the same environmental retention test was carried out, and the adhesive strength before and behind an examination was measured. A measurement result is shown in Table 1.

[0055] 40 g of comparative example tetrahydrofurfuryl acrylate, 40 g of trimethylolpropane triacrylate, and 20 g of spiroglycol urethane acrylate were mixed, and adhesive base resin was prepared.

[0056] Addition candle power mixing of 5g of 4-dimethylamino acetophenones and 5 g of the benzophenone was carried out to this base resin whole quantity, and the adhesives for metal hubs were prepared.

[0057] These adhesives were used, the metal hub was pasted up on the magneto-optical disc made from polycarbonate like Example 1, the same environmental retention test was carried out, and the adhesive strength before and behind an examination was measured. A measurement result is shown in Table 1.

[0058]

[Table 1]

	初期接着強度 (kgf/cm <sup>2</sup> )	環境保存試験後の接着強度 (kgf/cm <sup>2</sup> )
実施例 1	4.8	3.7
実施例 2	5.2	4.0
実施例 3	5.0	3.8
実施例 4	4.9	3.7
実施例 5	4.9	3.5
比較例	2.5	8

[0059]

[Effect of the Invention] This invention is the acrylic UV cure adhesive containing the acrylate which has a carboxylic acid group as mentioned above (meta), and a photoinitiator. By using this UV cure adhesive, it excels in the adhesive strength of a metal hub and a resin substrate, adhesive strength is held also in acceleration durability test, such as an environmental retention test, and practical use of a metal hub can be enabled.

[Translation done.]